# IOT Based Technology to Detect Driver fatigue to Avoid Road Accidents

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**ABSTRACT**

Many people may not know how to tell whether they are too tired to drive, even when they are aware that it is dangerous to do so. With the help of the recommended remedy, you will discover how to recognize potential driver fatigue and react accordingly. The three primary categories of currently employed techniques are physiological, behavioral, and vehicular. The vehicle-based methods use steering control, brake control, pedal acceleration, and lane deviations, among other variables. The behavioral-based methods use things like eye blinking, head position, and the mouth-to-eye ratio during yawning. The physiologically based methods employ measures including heart rate, muscle, and brain activity. The purpose of these gadgets is to monitor a driver's level of sleepiness and alert him about collisions. Since the accuracy for detecting sleepiness is very low, the proposed system would combine both methods to develop a hybrid system in order to boost the detection rate. A buzzer is installed to alert drivers when they are observed to be sleepy. This would allow the driver to take a break or have a cup of coffee rather than driving for long stretches of time without realizing that he is too tired. The proposed approach will additionally detect the collision and send the vehicle's owner an SMS with the driver's location if the buzzer is unable to wake the driver and a minor collision happens. This project addresses the significant issue of driver fatigue, a leading contributor to traffic accidents, by developing a system that can detect driver fatigue and alert the driver. The main concept is to continuously monitor the driver for signs of fatigue, such as extended eye closure or strange blinking patterns, using a camera or sensors.

**Keywords:** Driver Drowsiness Detection, Autonomous Vehicle Control, Fatigue Monitoring System, Road Safety Enhancement

## I. INTRODUCTION

The need for modern transit has grown in recent years, necessitating a quicker development rate for car parks. Nowadays, people's primary means of transportation is the automobile. Global sales of automobiles reached 97 million in 2017—a 0.3% increase over 2016 [1]. According to estimates, there were over 1 billion automobiles in operation worldwide in 2018 [2]. The car has altered people's lifestyles and made daily tasks more convenient, but it also has a lot of drawbacks, like increased risk of traffic accidents. According to a National Highway road Safety Administration data [3], there were 7,277,000 road incidents in the US in 2016, which led to 3,144,000 injuries and 37,461 fatalities. Tired driving was a contributing factor in between 20% and 30% of these collisions. As a result, driving while fatigued poses a serious and hidden risk in traffic accidents. The fatigue-driving-detection system has gained a lot of attention in recent years. Subjective and objective detection are the two categories into which the detection techniques fall. The subjective detection approach involves a driver's subjective views through appraisal, self-questioning, and questionnaire completion. The drivers can then adjust their schedules by using this data to estimate the number of cars being driven by fatigued drivers. The objective detection approach, on the other hand, does not require driver feedback because it continuously observes the driver's physiological condition and driving behavior [4]. The driver's level of weariness is assessed using the data gathered. Additionally, there are two types of objective detection: contact and non-contact. Since non-contact methods do not require sophisticated cameras or computer vision technology, they are more affordable and practical than contact methods. This is because more cars can utilize the device.

## II. RELATED WORK

Belal Alshaqaqi [1] et.al has proposed One of the main causes of traffic accidents is driver fatigue and exhaustion. Every

year, they increase the number of deaths and injuries that occur globally. This study presents a module for the Advanced Driver Assistance System (ADAS) to increase transportation safety and reduce accidents brought on by tired drivers. This system uses computerized reasoning and visual data to govern the position of programmed driver sluggishness. For the purpose of quantifying PERCLOS, an experimentally supported fraction of sluggishness associated with slow eye conclusion, we suggest a computation to locate, monitor, and analyses the driver's face and eyes. Drivers' weariness and exhaustion are among the main reasons for traffic accidents. They cause more deaths and injuries worldwide each year. In order to improve transportation safety and decrease accidents brought on by fatigued drivers, this study proposes an Advanced Driver Assistance System (ADAS) module. This technology takes automated reasoning and visual data into account while creating a customized driver drowsiness area. We suggest a calculation that locates, analyses, and analyses the driver's face and eyes in order to measure PERCLOS, a fraction of sluggishness linked to slow eye conclusion that has experimental support.

Hemant Kumar Dua [2] et.al has proposed in this system People are unable to acquire adequate rest and sleep in the busy and feverish environment of today. Because of this, people might nod off while driving after a restful night's sleep, which could lead to deadly collisions. Sleepy driving causes several accidents each year, many of which go unreported and result in significant losses in terms of both lives lost and financial damages. We introduce a method that notifies the driver if they are feeling sleepy while operating a motor vehicle. In a sense, these frameworks are available in very high-quality automobiles. Our solution makes advantage of the front-facing camera on the driver's cell phone. Any typical Android phone's camera can identify closed eyes and performs effectively in a range of scenarios. Consequently, we provide consumers with an affordable technology. Driving when fatigued or after prolonged periods of inactivity is exceedingly dangerous. There have been an estimated 70,000 collisions, 50,000 injuries, and 1,000 fatalities due to drowsy driving. Every year, there are also about 6,000 fatal accidents. According to a survey, 60% of respondents have driven when fatigued, and 37% of respondents have acknowledged dozing off while driving in the previous 12 months. Four percent of drivers acknowledged that they were asleep when they were involved in an accident.

WANGHUA DENG [3] et.al has proposed in this system The face is an important bodily part that communicates a lot of information. The facial expressions of a tired driver are different from those of a typical driver, including the frequency of blinking and yawning. In this study, we present DriCare, a system that uses video images to identify drivers' levels of weariness based on their eye closure duration, yawning, and blinking without the need for devices on their bodies. To address the shortcomings of existing face tracking algorithms, we introduce a novel face tracking approach to increase tracking accuracy. Furthermore, we created a novel facial region identification method based on 68 crucial elements. We then evaluate the drivers' condition using these facial features. DriCare can combine the eyes and mouth to alert the driver with a fatigue warning. The experiment's findings demonstrated that Dri Care's accuracy was approximately 92%. Faster car park growth is required due to the recent surge in demand for modern mobility. Nowadays, most people need to use an automobile for transportation. 2017 saw 97 million cars sold worldwide, a 0.3% increase over 2016 [1]. There were over 1 billion automobiles in use globally in 2018, according to a comprehensive estimate [2]. Automobiles have revolutionized people's lives and made daily tasks easier, but they also have many negative effects, such as increasing the risk of traffic accidents. In 2016, the National Highway automobile Safety Administration reported that 3,144,000 people were wounded and 37,461 people died in automobile accidents in the United States [3]. Driving while fatigued was the cause of 20% to 30% of these collisions.

Rajat Garg [4] et.al has proposed in this system offers a fresh perspective on vehicle safety and security.

Using non-interfering machine vision-based notions, we offer three concepts that are linked but different: an Iris Recognition framework, a Tired Driver Recognition framework, and a Pain Flagging Framework. Fatigue-related car theft and collisions have sharply increased recently. In addition to an enhanced sleep detection and driver warning

system that uses an infrared thermal sensor to track the driver's eyes and body temperature changes, we have also incorporated biometric security through iris recognition, which will help with authentication. The inclusion of a distress signaling system allows drivers to call the police for assistance without alerting any nearby residents. This paper discusses computer vision, optics, and pattern recognition. I processed all of the images using NI Vision Assistant. Automation enhances lifestyles by combining several systems into a single, understandable, and non-threatening solution. Given the range of advantages provided, it is projected that more and more individuals will choose the Smart Car option. The desire to live a more comfortable life and thievery are the causes of this. The design of anti-theft car systems can make use of biometric identity technologies, such as speech verification, fingerprint recognition, facial recognition, and others, which offer a fresh way to personal identification because of their secure access and natural approach. The development of new ideas for One of the biggest challenges in the field of accident evasion frameworks is identifying or preventing sluggishness in the driver's seat. Because drowsiness can be dangerous when driving, strategies to lessen its effects are required.

Ratna Kaavya [5] et.al has proposed in this system Drivers worldwide are involved in accidents as a result of their inability to concentrate on the road. When someone drives without stopping, their concentration deteriorates and they become drowsy. Additionally, chronic fatigue serves as an excuse for serious accidents. The creation of numerous sleep-detecting devices resolves this problem. In order to identify the type of sluggishness, the suggested framework here makes use of a Raspberry Pi and several sensors, including gas and vibration sensors. For surveillance purposes, a camera that captures the driver's vital signs is installed in the car. Longer eye closure results in the transmission of the person's picture. A vibration sensor is used to detect the accident, and scope and longitude are sent to the server. The car broadcasts its location using its built-in IOT modem. When the gas sensor detects that the driver has consumed alcohol, it sends a notification to the server. The car's motor may be turned off or stopped if the server side is notified that the driver is not in a position to operate the vehicle. This lowers the accident rate and the risk to the lives of customers. Everyone needs to sleep, but many people do not realize how crucial it is since it allows people to recuperate and reenergize so they can go back to work every day. When people do not get enough sleep, their bodies and minds become lethargic and unproductive. Numerous statistics indicate that weariness is a contributing factor in 20% of accidents. The four main causes of driver weariness are physical exhaustion, labour, sleep, and time. At regular intervals, a mishap results in one death. There are two ways to identify drowsiness: eye retina detection and pulse pattern detection. Human sleep comes in three varieties.

Current systems often fail to actively prevent collisions by stopping the vehicle, despite being effective at detecting driver weariness and sending out alerts. Current technologies primarily focus on alerting the driver through visual or auditory cues when fatigue is detected by eye closure, blinking patterns, head movements, steering wheel deviations, or even physiological indicators. By encouraging the driver to take a break or make apologies, for instance, these technologies aim to improve the situation. However, they are contingent upon the driver's response to the warning. Since they lack the essential capability to autonomously intervene and safely stop the vehicle in the event that the driver does not respond to the sleepiness alarms, there is a gap in ensuring complete safety in emergency situations.

## III. PROPOSED SYSTEM

The suggested system aims to solve the drawbacks of existing driver drowsiness detection technologies by incorporating an autonomous car-stopping mechanism that is triggered when a driver continuously ignores sleepiness signals. By continuously observing visual cues (eye closure, blinking), head movements, and even physiological markers, our method improves on current methods for detecting driver fatigue and adds a crucial safety layer. After a predetermined amount of detected fatigue, the system will begin a controlled slowing and safe stopping of the car if the driver does not react to the growing visual and auditory warnings. By ensuring that the vehicle will be stopped even if the driver is unable to react due to excessive tiredness or microsleep, this preventative step significantly lowers the likelihood of accidents. During the

controlled stop, the device will also turn on a hazard light to warn other cars.

**NODE MCU**

Open-source firmware for the Node MCU and plans for open-source prototyping boards are available. The phrases "node" and "MCU" (micro-controller unit) are combined to form the name "Node MCU". [Reference required. In particular, "Node MCU" refers to the software itself, not the development kits that go with it. The software itself and the prototyping board designs are both free source. The firmware utilizes the Lua programming language. The firmware is based on the eLua project and is based on the Espress if non-OS SDK for ESP8266. It makes extensive use of open-source programs, such as SPIFFS [10] and lua-cjson [9]. Users must select the appropriate modules for their project and create a firmware that meets their requirements. There is also 32-bit ESP32 support now available. Prototyping usually involves a dual in-line package (DIP) circuit board. It combines a tiny surface-mounted board with the MCU and antenna with a USB controller. Selecting the DIP format simplifies breadboard prototyping. The architecture was initially based on a Wi-Fi SoC combined with a ten silicon Xtensa LX106 core, which is commonly used in IoT applications (see related projects). NodeMCU was. On October 13, 2014, developer Hong uploaded the first node mcu-firmware file to GitHub, launching Node MCU.

The Lua scripting language is a lightweight, user-friendly programming language that may be used to program the Node MCU. Because the Node MCU firmware has a Lua interpreter, programming can run directly on the board. Additionally, the firmware offers a collection of integrated modules that may be used to carry out a number of functions, including reading sensor data, establishing an internet connection, and managing GPIO pins. Another tool for programming the Node MCU is the Arduino IDE, which offers an easy-to-use interface for creating, compiling, and uploading code to the board. To communicate with the board's hardware, including the Wi-Fi module and GPIO pins, the ESP8266 Arduino Core offers a collection of libraries.

**RELAY**

A relay is an electrically powered switch. It features a set of input terminals for one or more control signals in addition to a set of operating contact terminals. The switch may have a large number of contacts in different contact structures, such as break contacts, make contacts, or combinations of these. The employment of relays occurs when a single low power signal is required to control several circuits or when a separate low-power signal is required to control each circuit. Originally used in long-distance telegraph lines, relays serve as signal repeaters, refreshing the signal that enters from one circuit by sending it on a separate circuit. Relays played an important role in the logical processes of early computers and telephone exchanges. The traditional kind of transfer uses an electromagnet to shut or open the contacts, while strong state transfers, which rely on semiconductor features for control instead of moving parts, are another example of a transfer that uses a different operating standard. Digital devices known as protective relays in modern electric power systems continue to perform these tasks by using relays with calibrated operating characteristics and sometimes multiple operating coils to protect electrical circuits from overload or faults. To work the switch persistently, locking transfers just demand a single beat of control ability.

While repeated beats of the same kind have no effect, a heartbeat with reversed extremity or one more heartbeat applied to a second configuration of control terminals resets the switch. When the power was cut off Magnetic latching relays are helpful since they should not interfere with the circuits they are managing.

**BUZZER**


A buzzer or beeper is an example of an audio signaling device that can be mechanical, piezoelectric, or electromechanical. Converting the audio signal to sound is its primary purpose. Timer devices, printers, alarms, laptops, and other gadgets typically require DC voltage to power their electronics. It can produce a variety of sounds, including sirens, bells, music, and alarms, depending on the varied designs.

Below is a picture of the buzzer's pin arrangement. It has two pins: the positive and the negative. The "+" sign or a longer terminal is used to indicate this's positive terminal. While the negative terminal is denoted by the "-" symbol or short terminal and is attached to the GND terminal, this terminal is powered by six volts.

**MOTOR**


A DC motor is any rotational electrical motor that transforms electrical energy from direct current (DC) into mechanical energy. The most prevalent kinds depend on the forces generated by induced magnetic fields brought on by the coil's current flow. A DC motor is any rotational electrical motor that transforms electrical energy from direct current (DC) into mechanical energy. Most types are based on the forces produced by induced magnetic fields caused by the coil's current flow. An inbuilt electromechanical or electronic device in almost all types of DC motors periodically reverses the motor's current direction. DC motors were the first to be widely used because they could be powered by existing direct-current lighting power distribution networks.To adjust a DC motor's speed over a broad range, one can either use a variable supply voltage or change the intensity of the current in the motor's field windings. Toys, gadgets, and appliances all employ tiny DC motors. A portable brushed motor that operates on either alternating current or direct current is the universal motor. Appliances and portable power tools both use it. Larger DC engines are currently used in steel moving plant drives, lifts, derricks, and electric vehicle propulsion. In many applications, replacing DC engines with AC engines is now possible thanks to the development of force devices.

**EYE BLINK SENSOR**

One kind of sensor that can identify and quantify eyelid movement is an eye blink sensor. Medical applications frequently use it to detect and track neurological problems like Parkinson's disease as well as conditions like sleep apnea and other sleep disorders. A tiny infrared transmitter and receiver installed close to the eye usually make up an eye blink sensor. When the eyelid is closed, the infrared light emitted by the emitter is reflected back to the receiver. After detecting the reflected light, the receiver produces a signal that a microcontroller or other electronics may handle.

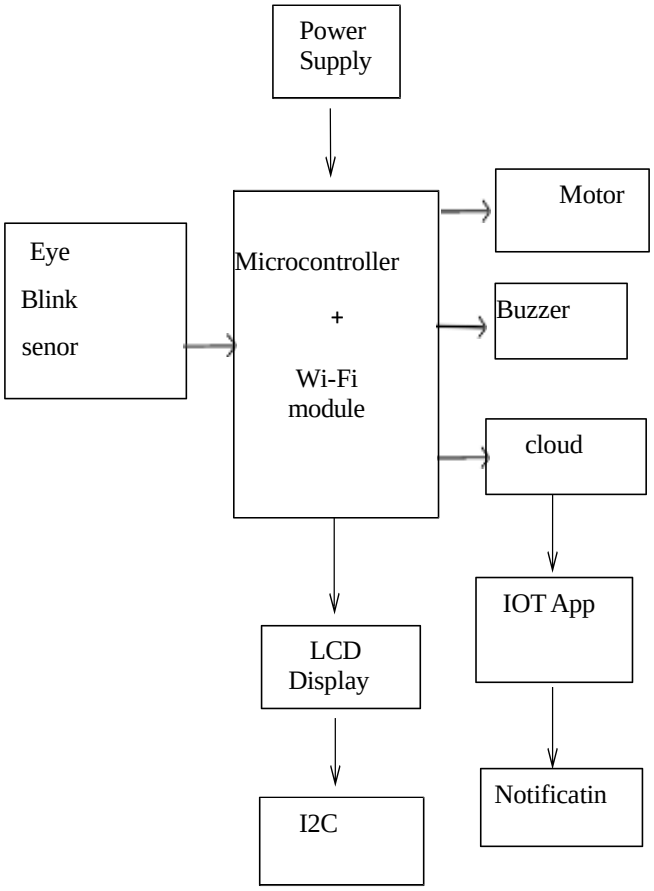
• Common medical uses for eye blink sensors include: • Eye blink sensors are useful for diagnosing and tracking sleep apnea, a disorder in which breathing pauses and resumes while you are asleep. The sensor can identify when a person

stops breathing while they are asleep and sound an alarm or other alert by tracking the movement of the eyelid.

• Sleep Disorders: Narcolepsy and REM sleep behavior disorder are two more sleep disorders that can be diagnosed and tracked with eye blink sensors.Parkinson's disease is a neurological condition that impairs movement and coordination. Its severity can be tracked with eye blink sensors. The sensor can give information about how the disease is progressing by tracking the frequency and length of eye blinks.

**UML DIAGRAM**

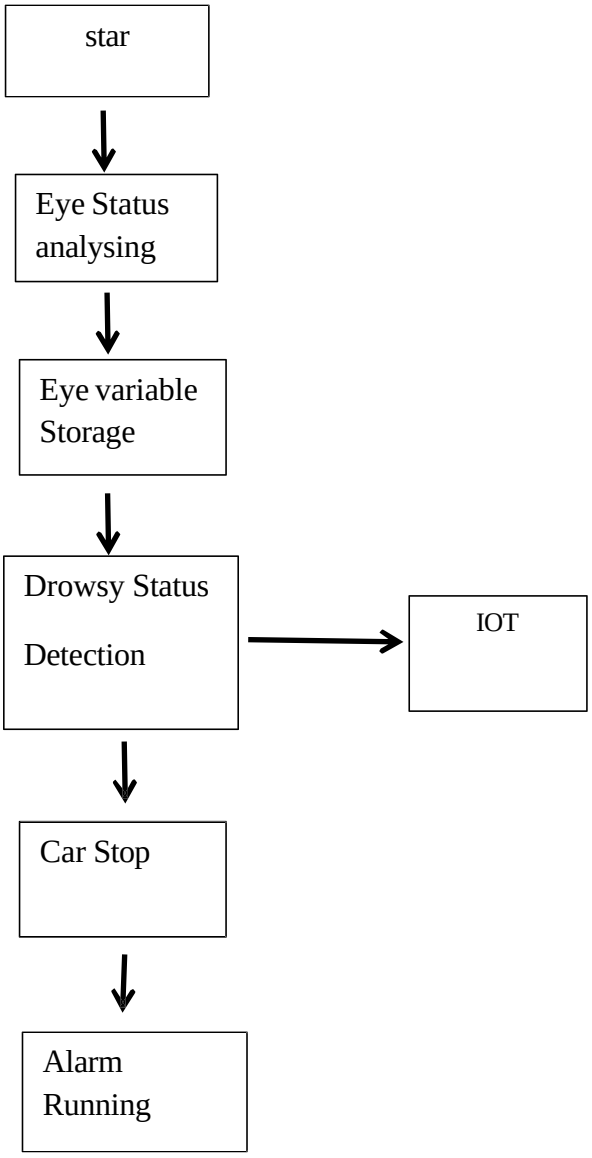
Software engineers utilize the Unified Modelling Language (UML), a standardized visual modelling language, to produce visual representations of systems. To represent and record different facets of a system's behavior and structure, UML offers a collection of diagrams and notation rules. It aids in the construction, specification, documentation, and visualization of a software system's artifact




**Block Diagram of System Implementation**

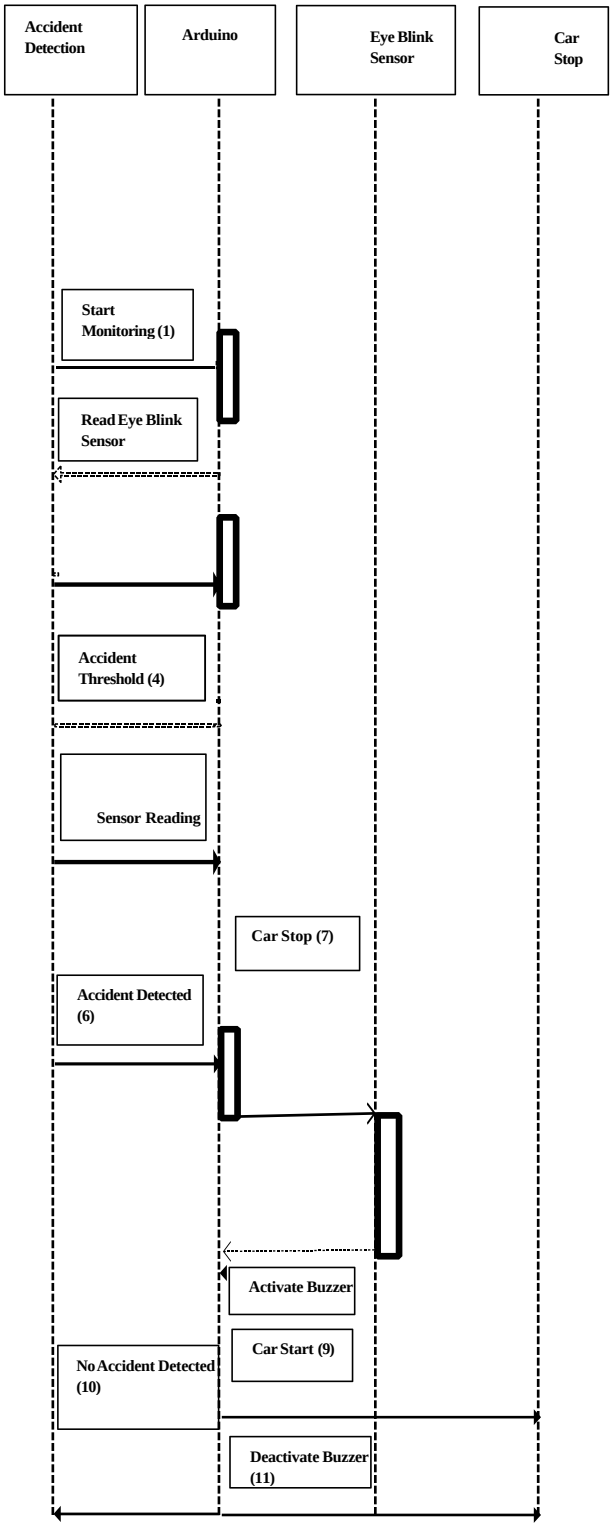
**USE CASE DIAGRAM**

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will of to be accompanied by other types of diagrams as well. The use cases are present



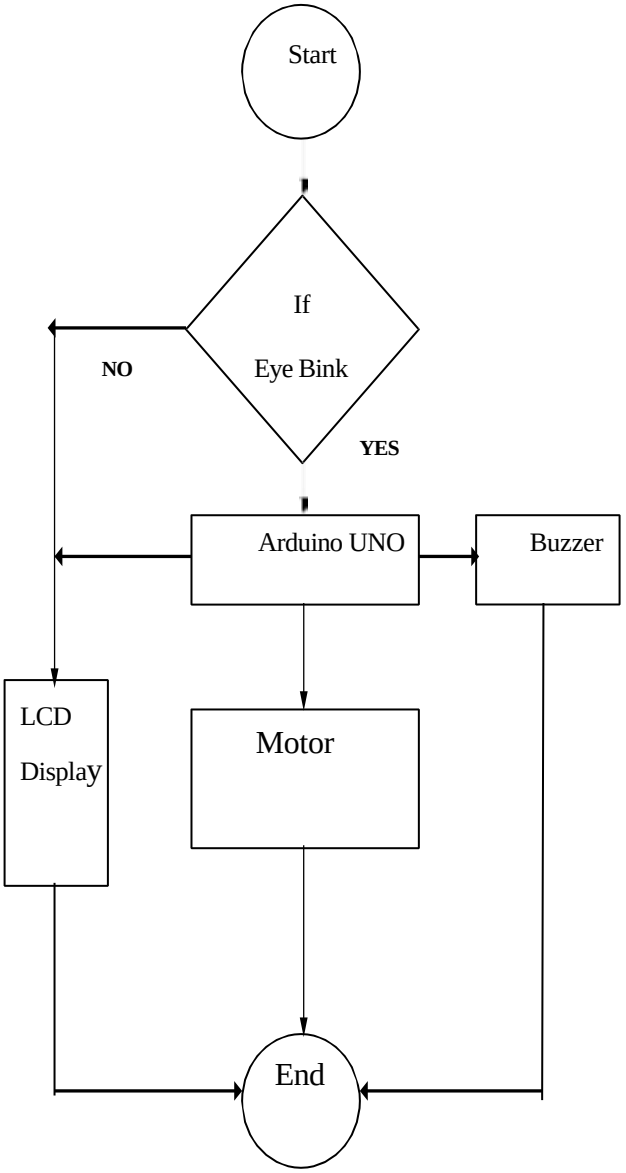
## SEQUENCES DIAGRAM

Simply said, a sequence diagram shows how items interact in a sequential order. Sequence diagrams show how a system's objects work together and what order



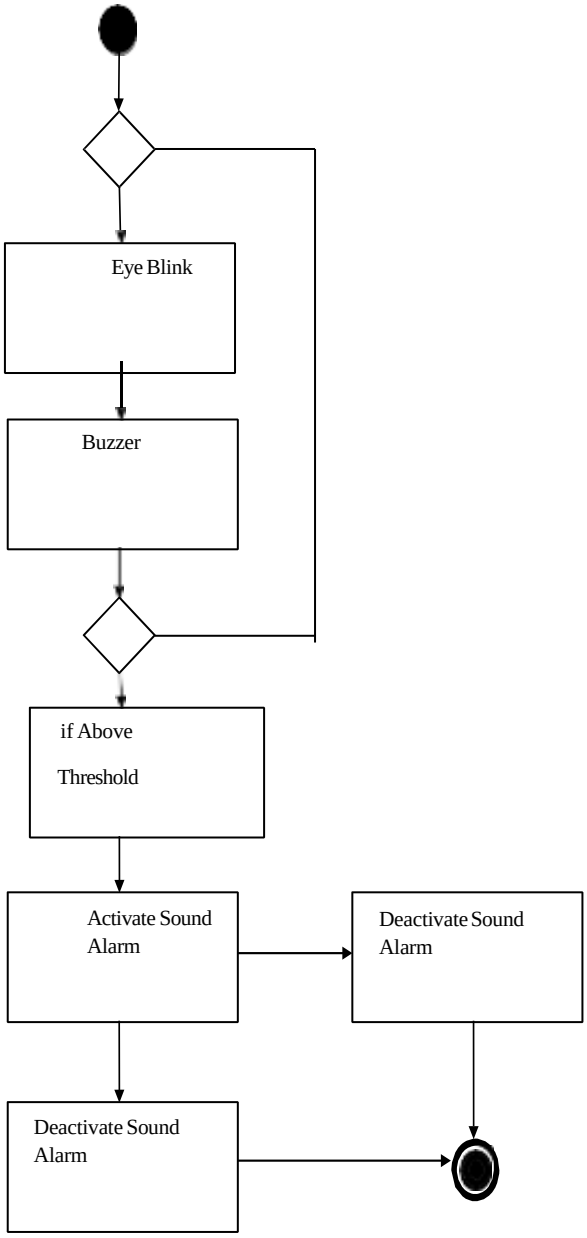

## DATA FLOW DIAGRAM

One method of illustrating the data flow of a system or process is via a data-flow diagram (DFD). Each entity's and the process's inputs and outputs are also detailed in the DFD. There are no loops, rules, or control flow in a data-flow diagram.



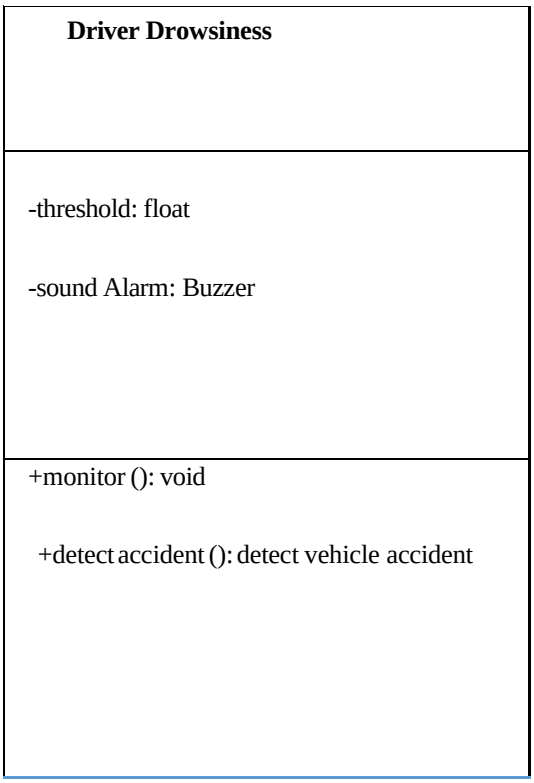
**ACTIVITY DIAGRAM**

In essence, an activity diagram is a flow chart that shows how one activity leads to another. One way to define the activity is as a system operation. One action to another draws the control flow. Thisflowmay be concurrent, branching, or sequential. Activity diagrams use a variety of components, including join and fork, to address all forms of flow control.




**CLASS DIAGRAM**

In the Unified Modelling Language (UML), a class diagram is a kind of static structural diagram that illustrates a system's classes, attributes, operations (or methods), and object relationships in order to describe the system's structure.The primary component of object-oriented modelling is the classdiagram.




**V. CONCLUSION**

In conclusion, the development of a driver sleepiness detection system that combines an autonomous car-stopping mechanism and buzzer alarm represents a significant advancement in proactive vehicle safety. In some places, this is particularly important for lowering the risk of accidents involving exhaustion. The major shortcomings of the existing alert-based systems are addressed by this proposed approach, which continuously monitors driver behavior, issues progressively more severe warnings, and then intervenes with a controlled halt when unresponsiveness is detected. Ensuring the reliability, accuracy, and security of this innovative solution will require extensive validation and verification

processes tailored to real-world driving scenarios and user input. In the end, this will help to drastically reduce the number of traffic accidents brought on by drowsiness and advance a safer transportation environment.

## VI. FUTURE WORK

In order to integrate more complex multi-modal drowsiness detection for a more accurate and personalized fatigue assessment, future developments to this driver drowsiness and autonomous car-stop system may focus on combining physiological sensors (like heart rate variability and EEG, if possible) with visual cues. Integrating the system with advanced driver-assistance systems (ADAS) like adaptive cruise control and lane keeping assist could enhance the system's environmental awareness and enable safer and more seamless autonomous stopping man oeuvres.

Adding connectivity components could also allow the system to notify emergency services of the driver's status and position in the case of a detected drowsiness episode and subsequent stop. Personalization through driver profiles that identify unique drowsiness patterns and adjust sensitivity accordingly, in addition to user-configurable warning levels, may boost user efficacy and uptake even further. Finally, for widespread and practical vehicle application, research into energy-efficient hardware and optimized algorithms would be crucial.

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